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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/924,787	08/08/2001	Sung-Bae Park	SAM-0234	2796

7590

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EXAMINER

LEWIS, MONICA

ART UNIT

PAPER NUMBER

2822

DATE MAILED: 05/22/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/924,787

Applicant(s)

PARK ET AL.

Examiner

Monica Lewis

Art Unit

2822

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 April 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 August 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

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DETAILED ACTION

1. This office action is in response to the election filed April 22, 2002.

Claim Objections

2. Claims 2 and 3 are objected to because of the following informalities: a) "of at least one of metal and polysilicon" appears to be a grammatical error (See Claim 2); and b) "of one of a metal layer, a tungsten layer, a silicon epitaxial layer" and "of at least two of a metal layer, a tungsten layer and a silicon epitaxial layer" appear to be a grammatical errors (See Claim 3). Appropriate correction is required.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 1-6 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is not clear what is meant by the following:
a) "forming a trench perforating an isolation region, the body, and the buried oxide layer"
(See Claim 1). Claims 2-6 depend directly or indirectly from a rejected claim and are, therefore, also rejected under 35 U.S.C. 112, second paragraph for the reasons set above.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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6. Claims 1 and 4, as far as understood, are rejected under 35 U.S.C. 103(a) as obvious over Applicant's Prior Art Drawings in view of Rutten et al. (U.S. Patent No. 5,889,293).

In regards to claim 1, Applicant's Prior Art Drawings disclose the following:

- a) a semiconductor substrate (20) (See Figure 2);
- b) a buried oxide layer (21) formed on the semiconductor substrate (See Figure 2);
- c) a body (14, 15) on the buried oxide layer, the body being an active region of a transistor (See Figure 2);
- d) a gate oxide layer (18) formed on a body (See Figure 2);
- e) a gate (16) formed on the gate oxide layer (See Figure 2); and
- f) a body contact (12) supplying power to the body (See Figure 2).

In regards to claim 1, Applicant's Prior Art Drawings fail to disclose the following:

- a) a trench perforating an isolation region, the body, and the buried oxide layer and filling the trench with a conductive material so that the body is electrically connected to the semiconductor substrate.

However, Rutten et al. ("Rutten") discloses a trench, which is filled with conductive material, that perforates various layers (See Column 7 Lines 35-53). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Applicant's Prior Art Drawings to include a trench, which is filled with conductive material, that perforates various layers as disclosed in Rutten because it aids in providing an electrical interconnection among the devices.

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In regards to claim 4, Applicant's Prior Art Drawings disclose the following:

a) a region into which predetermined impurity ions are implanted and generated on the semiconductor substrate in contact with the lower portion of the body contact so that an ohmic contact (110) is formed between the body contact and the semiconductor substrate (See Figure 3).

7. Claim 2, as far as understood, is rejected under 35 U.S.C. 103(a) as obvious over Applicant's Prior Art Drawings in view of Rutten et al.(U.S. Patent No. 5,889,293) and Adan et al. (U.S. Patent No. 5,841,170).

In regards to claim 2, Applicant's Prior Art Drawings fail to disclose the following:

a) gate is formed of at least one of metal and polysilicon.

However, Adan et al. ("Adan") discloses a gate that is composed of metal or polysilicon (See Column 10 Lines 9-11). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Applicant's Prior Art Drawings to include a gate composed of a metal or polysilicon as disclosed in Adan because they can withstand high temperature processing without degradation.

8. Claim 3, as far as understood, is rejected under 35 U.S.C. 103(a) as obvious over Applicant's Prior Art Drawings in view of Rutten et al.(U.S. Patent No. 5,889,293) and Hashimoto et al. (U.S. Patent No. 5,475,257).

In regards to claim 3, Applicant's Prior Art Drawings fail to disclose the following:

a) the conductive material formed of one of a metal layer, a tungsten layer, a silicon epitaxial layer, and a combination layer of at least two of a metal layer, a tungsten layer and a silicon epitaxial layer.

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However, Hashimoto et al. ("Hashimoto") discloses layers of metal, tungsten and silicon epitaxial (See Column 3 Lines 18-34). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Applicant's Prior Art Drawings to include layers of metal, tungsten and silicon epitaxial as disclosed in Hashimoto because they aid in increasing the speed of the device.

9. Claim 5, as far as understood, is rejected under 35 U.S.C. 103(a) as obvious over Applicant's Prior Art Drawings in view of Rutten et al.(U.S. Patent No. 5,889,293) and Lynch et al. (U.S. Patent No. 4,646,123).

In regards to claim 5, Applicant's Prior Art Drawings fail to disclose the following:

a) the trench narrows as the trench deepens.

However, Lynch et al. ("Lynch") discloses a trench that narrows as it deepens (See Figure 3). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Applicant's Prior Art Drawings to include a trench that narrows as it deepens as disclosed in Lynch because it aids in keeping voids from forming.

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10. Claim 6, as far as understood, is rejected under 35 U.S.C. 103(a) as obvious over Applicant's Prior Art Drawings in view of Rutten et al. (U.S. Patent No. 5,889,293) and Lynch et al. (U.S. Patent No. 4,646,123) and Abiko et al. (U.S. Patent No. 6,051,472).

In regards to claim 6, Applicant's Prior Art Drawings fail to disclose the following:


a) the trench narrows in a stepwise manner as the trench deepens.

However, Abiko et al. ("Akibo") discloses a trench that narrows in a stepwise manner (See Figure 17). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Applicant's Prior Art Drawings to include a trench that narrows in a step wise manner as disclosed in Abiko because it aids in keeping voids from forming.

Conclusion

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Monica Lewis whose telephone number is 703-305-3743. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr. can be reached on 703-308-4940. The fax phone number for the organization where this application or proceeding is assigned is 703-308-7722 for regular and after final communications. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

ML
May 16, 2002


CARL WHITEHEAD, JR.
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